Wireless

2948B Low Noise Communications Service Monitor

All the benefits of the 2945B but with a low phase noise signal generator, for more critical receiver testing

- Low phase noise signal generator
- High stability reference oscillator (OCXO) as standard
- Accurate power measurement to 150 W
- Transient and harmonic analysis
- Color transflective superfast LCD with rapid refresh rate for easy monitoring and real time adjustment
- Tracking generator with full offset tracking
- Full span spectrum analyzer with 'live' look and listen

The 2948B Communications Service Monitor is the lightest, most rugged service monitor available with low phase-noise signal generation. For field work, the 2948B provides an excellent combination of instruments for all types of maintenance work. In the workshop it provides all of the performance you would expect for exacting measurements.

Low Phase-Noise Signal Generator

The 2948B differs from its 2945B 'cousin' by providing a low phase-noise signal generator as standard. This enhanced capability allows accurate measurement of the noise characteristics of all FM receivers and is especially beneficial when making accurate measurement of narrow band receivers. The performance of the 2948B enables signal-to-noise measurements of better than 46 dB to be made on receivers with 12.5 kHz channel spacing.

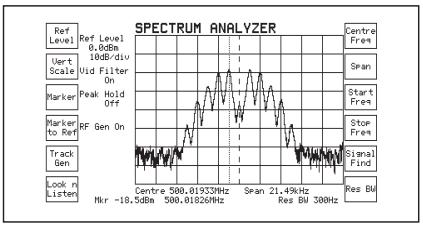
Field Operation

At under 12 kg the 2948B lightens the load to remote sites. The shape of the 2948B is ideal for carrying; the side handle ensures that the instrument is clear of the stairs when ascending buildings and the 2948B's depth is suitable for the instrument to be operated comfortably when it is placed on the floor.

A large color transflective (improved sunlight readable) display aids operation under harsh viewing conditions. An optional bail arm handle is also available. This option allows a stowage cover to be fitted over the front panel for storage of adapters and further protection to the instrument's front panel. A selection of cases are available including a hard transit case, standard soft carrying case or an integrated soft carrying/operational case allowing full operation without removal from the protective case.

Stored settings may be recalled from internal memory or from a memory card allowing fast and straightforward set up.

Fast Full Performance Spectrum Analyzer - Provided As Standard



The spectrum analyzer provides spans from 100 Hz per division to 100 MHz per division and also has a fully adjustable reference level. Speed is comparable with analog analyzers, allowing real time adjustments over the displayed dynamic range. With the tracking genera-

tor provided as standard, duplexers and filters can be aligned quickly and easily. An offset facility provides testing of equipment with frequency translation. Channel stepping can be performed by defining an increment and then using the FREQ ⇧⇩keys. This is particularly useful when testing multi-channel systems.

Live Look and Listen

This feature puts the 2948B above all of its peers with the ability to examine signals on the screen and demodulate them simultaneously. Intermittent interference can be isolated quickly and the signals then easily identified. The trace can be saved to the memory card along with the time and date, providing factual evidence that can be recalled later. This feature is particularly useful when looking for rogue transmissions, especially on busy base station sites.

From 2 µV to 150 Watts

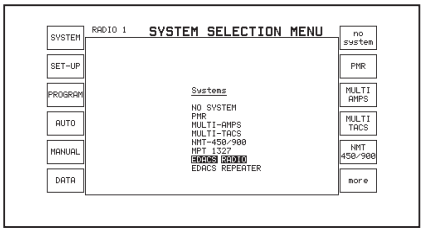
The 2948B measures the power of low level signals such as those encountered when monitoring off-air signals or those found when probing a circuit. 150 Watts measurement is provided without the need for external attenuators so the high power of base stations can be measured directly. Measurement accuracy of better than 10% is guaranteed all the way down to 5 mW on the N-Type connector, allowing cellular radios to be qualified at low power levels.

Accurate RF Signals

The signal generator provides coverage from 400 kHz to 1.05 GHz with +5 dBm output (+7 dBm overrange) and fast switching speed. Level accuracy is ±2 dB at all levels above -127 dBm.

Duplex - provided as standard

Full duplex operation is provided by the 2948B. This allows testing of duplex radios as well as simultaneous testing of repeater transmit and receive paths. There are no restrictions to the duplex offset.



PMR, Trunking and Cellular

The 2948B provides extensive support for the various tone signaling systems used in Professional Mobile Communications such as DTMF, TONE REMOTE (Option), DCS and CTCSS. Also a highly flexible user defined system enables the instrument to be configured to accommodate a wide variety of other tone formats that are in use.

Additionally trunked networks are supported with network signaling protocol simulations for MPT-1327/1343, LTR (available Oct 05) and EDACS radio / repeater measurements. Legacy analog cellular standards are also available internally and include AMPS, TACS and NMT with all country variants provided.

Remote Control - RS-232 or GPIB

Remote control is provided, with an RS-232 interface as standard. An IEEE-488.2 interface (option 5) can be fitted where other instruments are required to operate in a system with the 2948B.

Printing and Post Analysis

With the parallel printer port interface, screen dumps, automatic test results or previously stored results may be sent to most parallel printers. These facilities are available as standard using the serial RS-232 interface.

A screen capture facility is available so any screen displayed on the 2948B can be saved direct to a PC via the serial port as a bit map file.

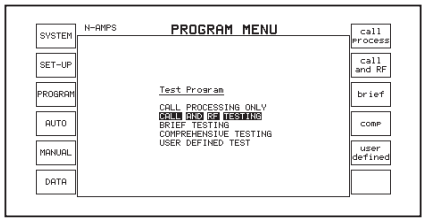
A single trace dump command allows fast transfer of the spectrum analyzer, OBW or transient analysis trace to be transferred as 249 ordinate values for detailed post-proccessing and analysis.

Autorun - internal control

With the Analog Systems Card fitted, automatic testing without an external controller is possible. Custom tests may be written and run by the operator. Four programmable relay contacts are provided with the optional parallel printer interface. This allows remote control of radios or test fixtures from built-in automatic tests.

Custom Programs

Users may program the instrument to suit their own specific needs. This is possible either by configuring any of the range of built-in programs or by using the MI-BASIC interpreter to produce a customized test program that can be executed internally, without an external controller.



Memory Card - with real time clock

The memory card drive meets the PCMCIA standard format for PC cards. The 2948B provides a DOS based filing system that allows transfer of information to a PC fitted with a memory card slot.

Test setups, test results, screen dumps, spectrum analyzer coordinates, and test sequences can all be stored on the memory card, allowing information to be easily stored and retrieved when required.

Reliability

The 2948B features high integration and a chassis designed to maximize mechanical protection.

Audio Analysis

A comprehensive and expanded range of filter selection is provided as standard, including band pass, low pass and high pass. Optional filters are available for psophometric weighting of audio signals and demodulation of signals in a simulated radio channel bandwidth.

The direct measurement of CTCSS is possible with the 300 Hz LP filter, even with speech present.

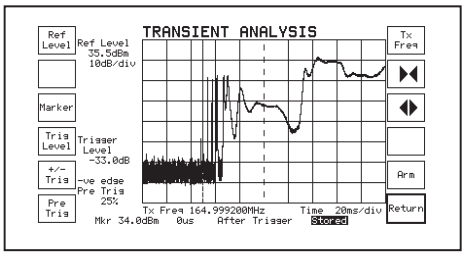
The standard 1 kHz notch filter provides for normal distortion/SINAD measurements. Additional notch filters can be added to enable distortion/SINAD measurements for signals in the range 50 Hz to 20 kHz where required.

Two comprehensive audio generators are provided as standard for internal modulation or audio sources for transmitter stimulus.

External DC coupled FM is provided.

Comprehensive Oscilloscope

Analysis of audio signals, whether from the demodulated signal or the audio input direct can be viewed for further inspection. The oscilloscope can either be combined with the measurement screen in the Tx, Rx or AF test modes or 'zoomed' to a full screen display. Different levels of persistence can be selected to allow short or long term effects to be captured.



Transient Analysis

The ability to capture transients on the rising or falling edge of a waveform provides a valuable tool for fault finding radios and radio systems. The user has full control of the trigger level and input attenuation as well as the timebase and five fixed trigger points, making this feature simple and flexible to operate.

Harmonic Analysis

An automatic harmonic analysis function is included in the 2948B. This complements the fast spectrum analyzer and allows a rapid check that the transmitter under test is not producing any excessive harmonics.

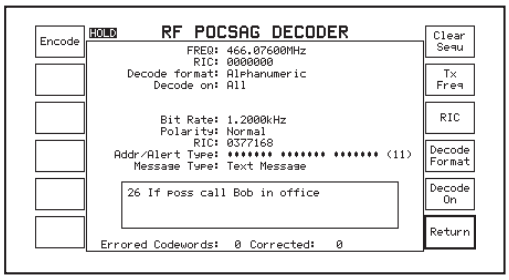
Tones Generation and Decoding

The tones menus include full remote control so that radio workshops can further automate their tasks. It is possible to enter tones durations of up to 20 seconds directly, simplifying operation with some of the more extreme tones systems in use. These and other improvements are in response to user feedback and allow better control of the tones from the top level screens.

POCSAG Decode - built in option

Off-air decoding of POCSAG signals is provided as an option.

This allows tone, numeric and alphanumeric messages to be displayed. Signals with bit rates of up to 4800 bits/s can be automatically decoded making the 2948B an ideal surveillance tool. The 2948B can be set to detect all messages, a user selectable RIC (just like a pager) or a fixed message string.



SPECIFICATION

RF SIGNAL GENERATOR

FREQUENCY

Frequency Range

400 kHz to 1.05 GHz

Resolution

10 Hz

Indication

10 digit display

Setting

Keyboard entry, delta increment/decrement function and rotary control

Accuracy

As frequency standard

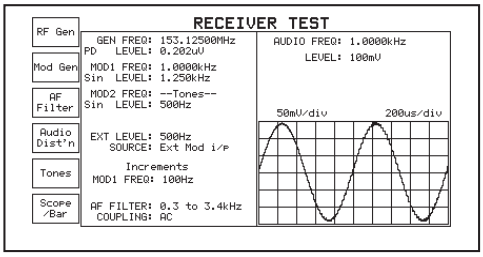
OUTPUT LEVEL

Output Level Range

Rx Test:

N-Type socket: -141 dBm to -21 dBm

BNC socket: -115 dBm to +5 dBm (overrange to +7 dBm)



Resolution

0.1 dB

Indication

4 digits plus sign (dBm, dBµV, µV, mV PD/EMF)

Accuracy

±2 dB for level above -127 dBm on N-Type socket up to 1 GHz

Atten Hold Facility (CW and FM modes only)

Allows user to define start point for seamless generator operation across a range of up to 20 dB (guaranteed 10 dB minimum)

Reverse Power Protection

N-Type: 50 W 10 minutes, normal operation. 150 W for 1 minute at 20°C.

Overload indicated by audible and visual warning

BNC: 5 W Overload indicated by audible and visual warning

Output Impedance

Nominally 50 Ω

VSWR

N-Type

Better than 1.2:1 up to 500 MHz

Better than 1.35:1 up to 1.05 GHz

BNC

Better than 2.2:1 up to 1.05 GHz

SPECTRAL PURITY

Residual FM

Less than 6 Hz RMS (0.3 to 3.4 kHz) up to 500 MHz

Less than 12 Hz RMS (0.3 to 3.4 kHz) up to 1.05 GHz

Harmonics

-25 dBc

Spurious Signals

Better than -50 dBc

SSB Phase Noise (20 kHz offset)

Better than -112 dBc/Hz up to 500 MHz

Better than -108 dBc/Hz up to 1 GHz

RF Carrier Leakage

Less than 0.5 µV PD generated in a 50 Ω load by a 2 turn loop 25 mm from the case. Output level less than -40 dBm into a sealed 50 Ω load.

AMPLITUDE MODULATION - INTERNAL

Frequency Range

400 kHz to 1.05 GHz

AM Depth Range

0 to 99%

Resolution

1%

Indication

2 digits

Setting

Keyboard entry, delta increment / decrement function and rotary control

Accuracy

For carrier frequencies from 1.5 MHz to 400 MHz

±5% at 50% for modulation frequency of 1 kHz

±7% ± 1 digit for modulation frequency of 1 kHz

±15% ±1 digit for modulation frequencies from 50 Hz to 15 kHz

Distortion

Less than 2% at 1 kHz for 30% AM, CCITT weighted

Modulation Frequency

5 Hz to 33 kHz

AMPLITUDE MODULATION - EXTERNAL

Input Impedance

Nominally 10 kΩ in parallel with 40 pF

Frequency Range

As internal AM

Modulation Frequency Range

As internal AM

Sensitivity

1 V RMS for 100% AM

FREQUENCY MODULATION - INTERNAL

Frequency Range

400 kHz to 1.05 GHz

Maximum Deviation

75 kHz

Indication

3 digits

Setting

Keyboard entry, delta increment/decrement function and rotary control

Accuracy [1]

±7% at 1 kHz modulating frequency

±10% at modulating frequencies from 50 Hz to 15 kHz

Distortion

Less than 1% at 1 kHz for deviation of 5 kHz, CCITT weighted

Modulation Frequency Range

5 Hz to 33 kHz

Resolution

25 Hz

Pre-emphasis

750 µs selectable

FREQUENCY MODULATION - EXTERNAL

Input Impedance

Nominally 10 kΩ in parallel with 40 pF

Frequency Range

As internal FM

Modulation Frequency Range

DC to 100 kHz

Pre-emphasis

750 µs selectable

Sensitivity

1 VRMS for 0 to 75 kHz deviation

MICROPHONE INPUT

Input Level

2 mV to 200 mV (AGC levelled)

Input Impedance

Nominally 150 Ω

Press To Talk (PTT)

When using the optional microphone in Tx Test mode, the PTT will switch instrument to Rx Test.

AUDIO VOLTMETER

Input Impedance

Nominally 1 MΩ in parallel with 40 pF

Frequency Range

DC and 50 Hz to 50 kHz AC only 50 Hz to 50 kHz Polarized DC (below 1 Hz)

Maximum Input Voltage

30 VRMS, 50 Vdc

Level Ranges

0 - 100 mV to 0 - 100 V RMS in a 1, 3, 10 sequence

Digital readout also in mW, dBm, dBV, dBr (user selectable)

External load R selectable compensation for 4, 8, 16, 75, 100, 150, 300, 600 Ohms

Peak hold facility

Resolution

1 mV or 1% of reading

Indication

3 digits and bar chart

Accuracy AC

±3% ±3 mV ± resolution up to 30 V RMS

Accuracy DC

±1% +50 mV up to 40 V

AUDIO FREQUENCY METER

Frequency Range

20 Hz to 50 kHz

Resolution

0.1 Hz, less than 10 kHz 1 Hz, at 10 kHz and above

Indication

5 digits

Accuracy

As frequency standard ± 1 digit ± resolution

Sensitivity

50 mV

AUDIO SINADMETER

Frequency

1 kHz (additional frequencies available with option 29)

Range

0 to 18 dB and 0 to 50 dB

Resolution

0.1 dB

Indication

3 digits and bar charts

Accuracy

± 1 dB

Sensitivity

50 mV (100 mV for 40 dB SINAD) reading suppressed if audio voltage is less than 5 mV

AUDIO DISTORTION METER

Frequency

1 kHz (additional frequencies available with option 29)

Range

0 to 10% and 0 to 30%

Resolution

0.1% distortion

Indication

3 digits and bar charts

Accuracy

±1 dB of reading ± 0.5% distortion

Sensitivity

50 mV (100 mV for 1% distortion) reading suppressed if audio voltage is less than 5 mV

AUDIO S/N METER

Range

0 to 30 dB and 0 to 100 dB

Resolution

0.1 dB

Indication

3 digits and bar chart

Accuracy

±1 dB

Sensitivity

50 mV (100 mV for 40 dB S/N) reading suppressed if audio voltage is less than 5 mV

AUDIO OSCILLOSCOPE

Operating Modes

Single or repetitive sweep

Frequency Range

DC to 50 kHz, 3 Hz to 50 kHz AC coupled

Voltage Range

10 mV to 20 V per division in a 1, 2, 5 sequence

Voltage Accuracy

±5% of full scale

FM Ranges

±75, 30, 15, 6, 3 and 1.5 kHz deviation full scale, ±10% accuracy

AM Ranges

20, 10 and 5% per division, ±10% accuracy

Timebase

50 µs/div to 5 s/div in a 1, 2, 5 sequence

Graticule

10 Horizontal by 6 Vertical divisions

Special Features

Built in anti-aliasing circuitry and variable decode trigger level

AUDIO BAR CHARTS

Bar chart Displays

AF Voltage, SINAD, Distortion, S/N

Vertical Resolution

2% of full scale

Ranging

Auto-ranging, range hold or manual selection
1, 2, 5, sequence with hysteresis

Audio and Modulation Filters

Lowpass filters

Four independently configurable Lowpass filters LP1, LP2, LP3, LP4 that can be set to any frequency cut off point from 250 Hz to 20000 Hz (excluding the band 1001 Hz to 2999 Hz)

50 kHz Lowpass (No filters applied)

750 µs de-emphasis

Highpass filters

50 Hz Highpass, 300 Hz Highpass

Bandpass filters

Any combination of LP1, LP2, LP3, LP4 and the Highpass filters

Audio Analyzer General Features

Tones Mode

RF FREQUENCY METER

Frequency Range

400 kHz to 1.05 GHz (manual tune)

10 MHz to 1 GHz (auto-tune)

Resolution

1 Hz or 10 Hz, up to 1050 MHz, selectable

0.1 Hz, 1 Hz or 10 Hz up to 999 MHz, selectable

Indication

Up to 10 digits

Accuracy

As frequency standard ± resolution

Acquisition Time

Less than 1 second (manual)

Typically 3 seconds (auto-tune)

Sensitivity

Auto-tuned 5 mW (N-Type) 0.05 mW (Antenna port)
Manual Tuned:-34 dBm (N-Type) -60 dBm (Antenna port)

Auto or manual control of input attenuator

VSWR

N-Type: Better than 1.2:1 up to 500 MHz

Better than 1.25:1 up to 1.05 GHz

BNC: Better than 3:1 up to 1.05 GHz

RF POWER METER (BROADBAND)

Frequency Range

200 kHz to 1.05 GHz

Dynamic Range

5 mW to 150 W (N-Type)

0.05 mW to 250 mW (Antenna port)

Indication Units

Watts, dBm or dBW

Indication

3 digits or bar chart

Resolution

0.1 dB max, typically 1%

Accuracy (N-Type)

±10% ± resolution up to 1 GHz (FM & CW)

Maximum Continuous Rating

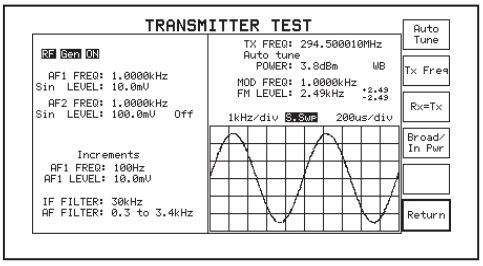
N-Type: 50 W at 20 °C

BNC output: 5 W

Antenna port: 1 W

Intermittent Rating

N-Type: 150 W for limited periods, typically 1 minute at 20 °C
Overload indicated by audible and visual warning



HARMONIC AND TRANSIENT ANALYSIS

Harmonic Measurement

Displays 1st to 5th harmonic of the selected carrier

Maximum Harmonic Frequency

1.05 GHz

Dynamic Range

0 to -60 dBc

TRANSIENT POWER ANALYSIS

Displays power profile against time

Frequency Range

1 to 1050 MHz

Dynamic Range

60 dB below spectrum analyzer reference level

Scale (power)

10 dB/div

Scale (time)

50 µs/division to 5 s/div

Trigger Level

Adjustable over full dynamic range +ve or -ve trigger selection

Pre-trigger

0, 25, 50, 75 or 100% of displayed period

MODULATION METER

Sensitivity

Auto-tuned: 5 mW (N-Type)

0.05 mW (Antenna port)

Manual Tuned:-34 dBm (N-Type)

-60 dBm (Antenna port)

Auto or manual control of input attenuator

Audio and Modulation Filters

Lowpass filters

Four independently configurable Lowpass filters LP1, LP2, LP3, LP4 that can be set to any frequency cut off point from 250 Hz to 20000 Hz (excluding the band 1001 Hz to 2999 Hz)

A 50 kHz Lowpass (No filters applied)

750 µs de-emphasis

Highpass filters

50 Hz Highpass, 300 Hz Highpass

Bandpass filters

Any combination of LP1, LP2, LP3, LP4 and the Highpass filters

AMPLITUDE MODULATION

Frequency Range

400 kHz to 1.05 GHz

Modulation Frequency Range

10 Hz to 15 kHz

AM Depth Range

0 to 99% (manually tuned)

0 to 90% below 100 MHz

0 to 80% from 100 to 400 MHz

Peak hold facility

Resolution

1% AM

Indication

2 digits and bar chart

Accuracy[1]

±5% ±1 digit at 1 kHz

±8.5% ±1 digit from 50 Hz to 10 kHz

Demodulation Distortion[1]

Less than 2%, at 1 kHz and 30% AM, (CCITT weighted)

Residual AM

Less than 1% (300 Hz to 3.4 kHz)

Demodulation Output

50 mV peak to peak for 1% AM

FREQUENCY MODULATION

Frequency Range

400 kHz to 1.05 GHz

Modulation Frequency Range

10 Hz to 15 kHz

Deviation Range

0 to 75 kHz

Peak hold facility

Resolution

10 Hz below 2 kHz deviation

1% above 2 kHz deviation

Indication

3 digits and bar chart

Accuracy[1]

±5% ± resolution at 1 kHz modulation frequency

±7.5% ± resolution for modulation frequencies 50 Hz to 10 kHz

Demodulation Distortion

Less than 2% at 1 kHz and 5 kHz FM, (CCITT weighted)

Residual FM

Less than 30 Hz (300 Hz to 3.4 kHz)

Demodulation Output Socket

200 mV peak to peak ±10% per 1 kHz deviation

RF SPECTRUM ANALYZER

Frequency Range

400 kHz to 1.05 GHz

Spans

1 kHz/division to 100 MHz/division in a 1, 2, 5 sequence or continuously variable

Start - stop facility allows selection of infinitely variable span width

Resolution Bandwidth

300 Hz, 3, 30, 300 kHz, 3 MHz

Reference Level (top of screen)

-50 dBm to +52 dBm 0.7 mV to 71 V

Displayed Dynamic Range

80 dB

Noise floor

Typically 75 dB below top of screen

On Screen Linearity

Typically ±2 dB ±1 resolution (10 dB/div) 10 dB above noise floor

Vertical Resolution

0.1 dB on 2 dB/division

0.5 dB on 10 dB/division

Level Flatness

±2 dB ± resolution (10 dB/div)

Intermodulation Distortion

Better than 70 dB for two signals at -30 dBm into first mixer

Sweep Speeds

10 ms/div to 200 ms/div in a 1, 2, 5 sequence (optimum sweep speed and bandwidth selected according to span or user selectable)

Span	***Resolution Bandwidth***	***Update (Sweeps/sec)***
10 kHz	300 Hz	5
100 kHz	3 kHz	9
1 MHz	30 kHz	9
10 MHz	300 kHz	9
100 MHz	300 kHz	5
1000 MHz	3 MHz	5

Marker Indication

Level and frequency or delta marker from center line of screen
Single marker for frequency and level display
Marker to center frequency marker

Features

Simultaneous 'Look and Listen' spans 100 kHz, 200 kHz, 500 kHz, 1 MHz

Sensitivity

2 µV

Tracking Generator Offset/Frequency Range

0-999 MHz/400 kHz to 1000 MHz

AUDIO GENERATORS

FREQUENCY

Frequency Range

5 Hz to 33 kHz (sine or square)

Setting

Keyboard entry, delta increment / decrement function and rotary control

Indication

5 digits

Resolution

0.1 Hz below 3.25 kHz

1 Hz above 3.25 kHz

Accuracy

0.01 Hz below 180 Hz, 0.1 Hz above 180 Hz

LEVEL

Level Range

0.1 mV to 4 VRMS

Setting

Keyboard entry, delta increment / decrement function and rotary control

Indication

4 digits

Resolution

0.1 mV below 409 mV

1 mV above 409 mV

Accuracy

± 5% + resolution 50 Hz - 15 kHz

Output Impedance

Nominally 5 Ω (minimum load 25 W)

Distortion

Less than 0.5% at 1 kHz

Less than 1% from 50 Hz to 15 kHz

Signaling Encoder/Decoder

Sequential tones functions including revert User defined tones

Encodes and decodes up to 40 tones. CCIR, ZVEI, DZVEI, EEA, EIA or user defined. Any of the tones may be extended. Continuous, burst and single step modes available. Up to two frequency plans may be defined and stored within the 2948B for sequential tones. Any of the standard tone frequency plans may be copied to user defined and modified.

Tone length 20 ms to 20 s

Standard tone frequencies may be selected from a menu

Generation and decoding of DTMF tones

Generation and decoding of DCS (Digitally Coded Squelch)

Generation of POCSAG code CCIR No.1 Rec 584. Bit rates from 400 to 4800 bit/s. Inversion available.

AUDIO MONITOR

Demodulated signals and audio signals may be monitored via the internal loudspeaker and the accessory socket output on the front panel.

CELLULAR AND TRUNKING

Test Modes

Auto test/manual test

Auto Test Programs (dependent upon which system in use)

Call processing only Call and RF testing Brief testing Comprehensive testing

Parametric Auto Test Routines

AF Frequency	*AF Level*
FM Deviation	*Mod frequency*
Rx Distortion	*Rx expansion*
Rx sensitivity	*Rx SINAD*
Rx S/N	*Tx Compression*
Tx Distortion	*Tx frequency*
Tx Level	*Tx Power Level*
Tx Limiting	*Tx Mod Level*
Tx Noise	*Tx SINAD Tx S/N*

Signaling Auto Test Routines

Registration/Roaming Update	*PTT On*
Place Call	*PTT Off*
Page Mobile	*SAT Deviation*
Clear from Land	*SAT Frequency*
Clear from Mobile	*ST Duration*

Handoff
Hook Flash
DTMF Decode
Data Performance
ST Frequency
ST Frequency
ST Deviation
DSAT Deviation

FREQUENCY STANDARD

INTERNAL FREQUENCY STANDARD (OCXO)

Frequency

10 MHz

Temperature Stability

Better than 5 parts in 10^8, 0 to 55°C

Ageing Rate

Better than 1 part in 10^7, per year, after 1 month continous use

Warm up

Less than 10 minutes to within 2 parts in 10^7 at 20°C

EXTERNAL FREQUENCY STANDARD INPUT

Frequency

1, 2, 5 and 10 MHz

Input Level

Greater than 1 V peak to peak

Input Impedance

Nominally 1 kΩ

GENERAL

Keyboard and Display

Logical color coded keyboard with color high resolution fast LCD

Display Size

160 x 85 mm

RS-232C

RS-232C interface is provided for printing and remote instrument control

Connector

9 way female 'D' Type

POWER REQUIREMENTS

AC Supply Voltage

100 - 240 V~ / 108 - 118 V~ (Limit 90 - 264 V~/98 - 132 V~)

AC Supply Frequency

50 - 60 Hz / 50 - 400 Hz (Limit 45 - 66 Hz / 45 - 440 Hz)

Maximum AC Power

190 VA

DC Supply Voltage

11 to 32 V

Maximum DC Power

100 W

CALIBRATION INTERVAL

2 years

ELECTROMAGNETIC COMPATIBILITY

Conforms with the protection requirements of Council Directive 89/336/EEC. Complies with the limits specified in the following standard:

IEC/EN61326-1 : 1997, RF Emission Class B, Immunity table 1, Performance Criteria B

Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC / EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for Class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 supply.

CALIBRATION INTERVAL

2 years

ENVIRONMENTAL

Rated Range of Use

0 to 50°C and up to 95% relative humidity at 40°C

Storage and Transport

Temperature

-30 to +70°C

Altitude

Up to 2500 m (pressurized freight at 27 kPa differential)

DIMENSIONS AND WEIGHT

Height

178 mm (7 in)

Width

380 mm (15 in)

Depth

457 mm (18 in)

(including handle, feet and covers)

Weight

Less than 12 kg (standard version)

OPTIONS AND ACCESSORIES

600 Ω MATCHING UNIT (OPTION 1)

INPUT CIRCUIT

Impedance

600 Ω

Return Loss

>21 dB at 1 kHz

Frequency Response

±0.5 dB at 200 Hz to 5 kHz, ±2 dB at 100 Hz to 20 kHz

Accuracy of 1:1 Input:Output Ratio

±1% at 1 kHz ± accuracy of 2945B or 2948B

Maximum Input

5 V RMS maximum at 200 Hz to 5 kHz
3 V RMS maximum at 100 Hz to 20 kHz

OUTPUT CIRCUIT

Impedance

600 Ω

Return Loss

>21 dB at 1 kHz

Frequency Response

±0.5 dB at 200 Hz to 5 kHz
±2 dB at 100 Hz to 20 kHz

Level Accuracy

±2% at 1 kHz ± accuracy of 2945B or 2948B

Output Level

1 mV to 2.5 V RMS across 600 Ω

ANALOG SYSTEMS CARD (OPTION 2)

This option provides automatic testing for cellular,trunked and FM radios and a BASIC Interpreter for customized tests.

PARALLEL INTERFACE (OPTION 4)

Allows direct connection of a parallel printer. Additionally provides 4 software programmable output lines.

Printer Port

Connector

25 way female D type

Printers Supported

75, 100, 150 dots per inch laser printers, FX 80, FX 100 Epson format

Accessory Port

Connector

9 way female D type

Outputs

4 independently programmable output lines, each one configurable as a logic line or as a relay contact closure. +5V supply available.

GPIB (OPTION 5)

Capability

For printing, remote instrument control or for programming of user defined test sequences.

Complies with the following subsets defined by IEEE488:- SH1, AH1, T6, L4, SR1, RL1, DT0, EI, DC1

MEMORY CARD DRIVE AND REAL TIME CLOCK (OPTION 6)

The memory card facility allows the storage of results, set-ups screen dumps and user programs with SRAM cards. Meets PCMCIA 2 standard.

Allows the current date and time to be stored with results to the memory card and/or printed with a screen dump.

SSB DEMODULATOR (OPTION 8)

The SSB demodulator allows signals to be demodulated either via the internal loudspeaker or via the accessory socket. Provides demodulation of SSB signals (upper and lower sideband)

Frequency Range

400 kHz to 1 GHz

AF Demodulation Range

10 Hz to 15 kHz

Distortion

Typically less than 3% at 1 kHz (300 to 3.4 kHz)

Detection Range

2 µV to 150 W

Features

Automatic detection of USB or LSB. BFO can be used for tuning of carrier for AM and FM radio's.

OCCUPIED BANDWIDTH MEASUREMENT (OPTION 9)

Calculates the bandwidth of a signal displayed on the spectrum analyzer.

Frequency Range

1 MHz to 1 GHz

Display Resolution

3 digits

Accuracy

20%

Bandwidth Measurement Range

3 kHz minimum

Ratio range 90% - 99% selectable in 0.1% steps

NMT CELLULAR SOFTWARE (OPTION 10)

NMT 450	*NMT 900*
Benelux	*NMTF*
Austria	*Spain*
Malaysia	*Indonesia*
Saudi 1	*Saudi 2*
Thailand	*Oman*
Tunisia	*Hungary*
Poland	*Russia*
Czech	*Bulgaria*
Slovenia	*Turkey*
USER DEFINED NMT	

AMPS CELLULAR SOFTWARE (OPTION 11)

E-AMPS	*N-AMPS USER DEFINED AMPS*

TACS CELLULAR SOFTWARE (OPTION 12)

E-TACS	*TACS 2 C-TACS I*
C-TACS II J-TACS	*N-TACS*
USER DEFINED TACS	

MPT 1327 TRUNKING SOFTWARE (OPTION 13)

BAND III	*JRC*
UK WATER	*HONG KONG*
AUTONET	*AMT*
MADEIRA	*NL-TRAXIS*
NZ MPT1327	*PH-INDO*
USER DEFINED MPT	

PMRTEST SOFTWARE (OPTION 14)

USER DEFINED PMR for FM radio's

EDACS™ RADIO TEST SOFTWARE (OPTION 15)

Provides Auto/Manual test capability for EDACS™ radios. Up to 4 User defined variants can be created and stored, each with up to 24 spot channel frequencies.

EDACS™ REPEATER TEST SOFTWARE (OPTION 16)

Provides Auto/Manual test capability for EDACS™ repeaters. Up to 4 user defined variants can be created and stored, each with up to 24 spot channel frequencies. A data logging facility is also available to continuously decode and display data messages from the repeater under test.

EDACS is an Ericsson GE registered trademark.

LTR TRUNKING TEST SOFTWARE (OPTION 18)

Provides Auto/Manual test capability for LTR Trunked radios. (Planned availability Q3 2006)

POCSAG DECODE (OPTION 22)

Allows off-air decoding of POCSAG messages. Can decode a message as it is received, or decoding can be triggered from a user selectable RIC code or fixed message pattern.

Bit Rate

Automatically decodes any standard bit rate up to 4800 bits/s. Numeric or alphanumeric decoding is provided.

Number of received errors is displayed.

CCITT FILTER (OPTION 23)

Allows a CCITT filter to be inserted into either the demodulated audio path or the audio input path

CMESS FILTER (OPTION 24)

Allows a CMESS filter to be inserted into either the demodulated audio path or the audio input path

AVIONICS (OPTION 25)

Provides amplitude modulated signals for testing ILS, VOR, Marker Beacons and SELCAL

(Full details of the Avionics features can be found in the Option 25 data sheet, Part number: 46891/213)

TONE REMOTE (OPTION 26)

Provides configuration screens and generation of Tone Remote control signals

PLUS 2 DISTORTION NOTCH FILTERS BOARD (OPTION 29)

The standard instrument is supplied with a 1 kHz notch for Distortion and Sinad measurements. This option allows the user to carry out Distortion/Sinad measurements at two additional frequencies. The two additional notch frequencies can be anywhere in the band 50 Hz to 20 kHz and must be stipulated at the time of ordering.

BAIL ARM/FRONT COVER (OPTION 30)

Provides a Bail arm carrying handle and front panel cover and storage area. The Bail arm will also provide additional viewing angles when mounted on a bench.

IF OUTPUT (OPTION 31)

Allows access to the IF signal from the rear of the instrument (Note: Incorporation of this option replaces the standard demod out capability)

Notes

(1) At low modulation levels the residual AM/FM may become significant.

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers	Versions
2948B	Low-Noise Communications Service Monitor
Options	
Option 1	600 Ω Matching Unit
Option 2	Analog Systems Card
Option 4	Parallel Interface†
Option 5	GPIB Interface†
Option 6	Memory Card Drive with real time clock
Option 8	SSB demodulator
Option 9	Occupied Bandwidth Measurement

-Note: Option 2 required when ordering any of the following options 10 to 18

Option 10	NMT Cellular
Option 11	AMPS Cellular
Option 12	TACS Cellular
Option 13	MPT 1327 trunking
Option 14	PMRTEST
Option 15	EDACS™ Radio Test
Option 16	EDACS™ Repeater Test
Option 18	LTR Trunking (Planned availability Q3 2006)
Option 22	POCSAG Decode
Option 23	CCITT Filter†
Option 24	CMESS Filter†
Option 25	Avionics
Option 26	Tone Remote
Option 29	Plus 2 Distortion Notch Filters board**
Option 30	Bail Arm and Front Panel Stowage
Option 31	IF Output Capability

Supplied Accessories

AC Supply lead

DC Supply lead

Operating Manual

Optional Accessories

44991/145	Microphone with PTT
59000/189	Memory Card (128k)
59000/375	Memory Card (2 M)

46662/779	Soft carrying case (suitable for all 2948/2948B)
46662/571	Soft carrying/optional case
46662/616	Soft carrying/optional case for use with Option 30
54112/163	Hard Transit Case
54431/023	20 dB AF attenuator (BNC)
46884/728	Rack Mounting Kit
54421/001	BNC Telescopic Antenna
46884/650	Serial port to PC control cable (9 way)
46884/649	Serial port to PC control cable (25 way)
46884/648	RS-232 Printer cable (25 way)
59999/170	RF Directional Bridge
54421/002	RF Directional Power Head (1 to 50 MHz)
54421/003	RF Directional Power Head (25 to 1000 MHz)
46880/115	Service Manual

† Options 4 and 5 can not be fitted together.

† Options 23 and 24 can not be fitted together.

** Option 29, The standard instrument is supplied with a 1 kHz notch for Distortion and Sinad measurements. This option allows the user to carry out Distortion/Sinad measurements at two additional frequencies. The two additional notch frequencies can be anywhere in the band 50 Hz to 20 kHz and must be stipulated at the time of ordering.

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